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(54) Title of the invention	METHOD FOR MOLDING MULTICOLOR ARTICLE, AND MOLD THEREOF	
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SPECIFICATION

1. TITLE OF THE INVENTION

Method for Molding Multicolor Article, and
Mold Thereof

2. SCOPE OF PATENT CLAIMS

1. A method for molding a multicolor article using a movable mold that has a molding portion and a plurality of stationary molds for forming cavities for respective molding portions, facing the movable molding portions, and corresponding to respective colors of plastic, to mold integrally a multicolor plastic article having a plurality of closed molding parts having peripheries that are surrounded by plastic of different colors, wherein:

when molding a first molding portion that includes a plastic part that surrounds a closed molding part, a groove-shaped gap is formed that is connected so as to link the plurality of closed molding parts;

following which, when molding, from a plastic of a color that is different from that of the first molding portion, a second molding portion that includes the plurality of closed molding parts, plastic is injected into each closed molding part through the groove-shaped gap.

2. A method for molding a multicolor article as set forth in Claim 1, comprising:

a first molding step wherein one movable small piece is caused to protrude from the movable mold into a cavity for a first molding portion, formed by causing the movable mold and a first stationary mold, for molding the first molding portion that includes a

plastic part for surrounding the closed molding part, and the movable mold to face each other, where, in a state wherein the movable small piece is caused to be in contact with the individual protruding pieces for structuring the plurality of closed molding parts of the first stationary mold, plastic is injected to mold the first molding portion; followed by

a movable small part retracting step for producing a groove-shaped gap that is connected by the retraction of the movable small piece; followed by

a second molding step for forming a second molding portion by switching the first stationary mold to a second stationary mold for molding a second molding portion that includes a plurality of closed molding parts, without removing the first molding portion from the movable mold, and a plastic of a color that is different from that of the first molding portion is injected into a cavity for a second molding portion that is formed by causing the second stationary mold to face the movable mold with the first molding portion still adhered therein, to mold the second molding portion it.

3. A mold for multicolor molding, for performing monolithic molding of a multicolor plastic article having a plurality of closed molding parts with the peripheries thereof surrounded by plastic of different colors, using a movable mold that has a molding portion and a plurality of stationary molds for forming cavities for respective molding portions corresponding to colors of plastics, by facing the molding portion of the movable mold, wherein:

the movable mold is provided with a groove that connects locations that correspond to the plurality of closed molding parts; wherein

a movable small part fits slidably into the groove; and

the movable small part can undergo reciprocating motion from a position of protrusion into a cavity for a molding portion to contact the opposing stationary mold, to a retracted position in the vicinity of the surface of the molding portion of the movable mold.

4. A mold for multicolor molding as set forth in Claim 3, wherein the movable small part is a single flat plate.

3. DETAILED EXPLANATION OF THE INVENTION (AREA OF USE IN INDUSTRY)

The present invention relates to a method for molding a multicolor plastic article such as a typewriter key, and to a mold for performing said molding.

(PRIOR ART)

In multicolored plastic articles such as, for example, typewriter keys or similar articles, a process is used wherein a first molding portion 3 having letter parts 2 and 2' for forming letters for the typewriter key 1 and a second molding portion 4, for forming the base, are structured from plastics of respectively different colors, and molded integrally, as illustrated in FIG. 12 and FIG. 13 because of this, only the first molding portion 3 is molded with a normal movable mold and a stationary mold for the first molding portion, following which the stationary mold is switched without removing the first molding portion 3, which has been molded, from the movable mold, and plastic of a different color is injected to mold a second molding portion 4 integrally with the first molding portion 3. At this time, there may be closed molding parts 5 and 5' having peripheries that are surrounded by the letter parts 2 and 2', depending on the letters that are formed. These closed molding parts 5 and 5', which may also be termed "island parts," cannot be filled with the plastic for the second molding parts unless they are provided with special plastic conduits.

Given this, in the conventional method pins pierce, from the movable mold, directly under the letter parts 2 and 2' that surround the closed molding parts 5 and 5' at the time of molding the first molding portion 3, to form, as illustrated in FIG. 14, a first molding portion 3 wherein are formed small holes 6 and 6' by the pins on the back side of the letter parts 2 and 2', where these small holes 6 and 6' are used as the plastic conduits to connect between the closed molding parts 5 and 5' and the open portion 7.

However, in this method, a pin must be provided for each individual closed molding part 5 and 5' to form the small holes 6 and 6', requiring a large

number of pins in typewriter keys wherein the closed molding parts 5 and 5' exist in large numbers, which causes the structure of the movable mold to be complex, and hence there is a problem in that the machining and assembly is extremely laborious.

Additionally, there is also a problem when molding typewriter keys that have identical shapes but have differences only in the spelling of the text, because it is necessary to change the movable molds because the pins will be in different positions depending on the text.

(PROBLEM SOLVED BY THE PRESENT INVENTION)

The present invention is to solve the problem areas set forth above, and the object thereof is to provide a molding method and a molding mold wherein it is possible to mold with ease a multicolored plastic article having a large number of closed molding parts, and possible to perform the molding, without changing the movable mold, insofar as it is a multicolored plastic article wherein there are only slight differences in the positions of only the closed molding parts.

(MEANS FOR SOLVING THE PROBLEM)

In the present invention for this purpose, a multicolored article molding method is provided that is method for molding a multicolor article using a movable mold that has a molding portion and a plurality of stationary molds for forming cavities for respective molding portions, facing the movable molding portions, and corresponding to respective colors of plastic, to mold integrally a multicolor plastic article having a plurality of closed molding parts having peripheries that are surrounded by plastic of different colors, wherein: when molding a first molding portion that includes a plastic part that surrounds a closed molding part, a groove-shaped gap is formed that is connected so as to link the plurality of closed molding parts; following which, when molding, from a plastic of a color that is different from that of the first molding portion, a second molding portion that includes the plurality of closed molding parts, plastic is injected into each closed molding part through the groove-shaped gap. Furthermore, the present invention provides, as a mold that is well-suited for performing the process described above, a mold for multicolor molding, for performing monolithic molding of a multicolor plastic article having a plurality of closed molding parts with the peripheries thereof surrounded by plastic of different colors, using a movable mold that has a molding portion and a plurality of stationary molds for forming cavities for respective molding portions corresponding to colors of plastics, by facing the molding portion of the movable mold, wherein: the movable mold is provided with a groove that connects locations that correspond to the plurality of

closed molding parts; wherein a movable small part fits slidably into the groove; and the movable small part can undergo reciprocating motion from a position of protrusion into a cavity for a molding portion to contact the opposing stationary mold, to a retracted position in the vicinity of the surface of the molding portion of the movable mold.

(EXAMPLE OF EMBODIMENT)

An example of embodiment according to the present invention will be explained in detail using the drawings.

FIG. 1 and FIG. 2 are cross-sectional diagrams of a mold for manufacturing a typewriter key; FIG. 3 is a plan view of a movable mold; FIG. 4 and FIG. 5 are plan views of first and second stationary molds, respectively; and FIG. 6 is a perspective view of a first molding portion.

In this example of embodiment, a movable mold 8 that is pressed and moved by a ram, and two stationary molds 9 and 10 are used to fabricate a typewriter key 1 having a plurality of closed molding parts 5 and 5' that are surrounded by the letter parts 2 and 2' as illustrated in FIG. 12. A molding portion 11 of the movable mold 8 is provided with a groove 12 that passes through the movable mold 8 in a location corresponding to the closed molding parts 5 and 5', and a flat plate 13 fits slidably into that groove 12. The flat plate 13 is pressed, by a spring, not shown, in the direction of protruding from the movable mold 8, and in the free state, the tip end portion thereof occupies a position that protrudes from the surface of the molding portion 11 of the movable mold 8. Additionally, the flat plate 13 can be retracted, against the force of the spring, by a mechanism, not shown, so that the tip end portion thereof is held so as to be positioned in the vicinity of the surface of the molding portion 11. The flat plate 13 structures a movable small piece for forming a groove-shaped gap for connecting a plurality of closed molding parts 5 and 5'.

First, as illustrated in FIG. 1, the movable mold 8 and the first stationary mold 9 for forming the first molding portion 3, which includes the letter parts 2 and 2' face each other and are pressed together, as illustrated in FIG. 1. At this time, the flat plate 13 is put into the free state. The flat plate 13 protrudes into the cavity for the first molding portion, due to the spring, not shown, so that the tip end portion thereof contacts each of the protruding portions 14 and 14' for forming the multiple closed molding parts 5 and 5' in the first stationary molds 9. In this state, plastic for molding the letter parts (which is, for example, black) is injected into the space for the first molding portion through a plastic guide conduit 15 and a gate 16, to form the first molding portion 3 that includes the letter parts 2 and 2'. Here the black plastic is not

filled into the location that is occupied by the flat plate 13 that protrudes into the cavity for the first molding portion, and thus, as illustrated in FIG. 6, the first molding portion 3 that is molded has a groove-shaped gap 17 for connecting the multiple closed molding parts 5 and 5' formed on the back side of the letter parts 2 and 2'.

Following this, as illustrated in FIG. 2, the flat plate 13 is withdrawn so that a groove-shaped gap 17 appears, and at the same time, the movable mold 8 is moved from the first stationary mold 9 to a second stationary mold 10, without the first molding portion 3 being removed from the movable mold 8, and the second stationary mold 10 and the movable mold 8 face each other and are pressed together. Then a plastic for the second molding portion of a color that is different from that of the first molding portion 3 (for example, white) is injected into a cavity for the second molding portion through the plastic guide conduit 18 and a gate 19, to mold a second molding portion 4, which forms a white background, integrally with the first molding portion 3 that forms the black letters. Here the flat plate 13 is withdrawn to the vicinity of the surface of the molding portion 11 of the movable mold 8, and thus a groove-shaped gap 17 that is formed on the back side of the letter parts 2 and 2' forms a connecting plastic conduit for connecting the multiple closed molding parts 5 and 5' to the open part 7. Because of this, it is possible to fill the white plastic reliably into the multiple closed molding parts 5 and 5' surrounded by the letter parts 2 and 2'.

In the example of embodiment set forth above, the explanation was for a typewriter key 1 that has only two closed molding parts, in order to explain the operation clearly. However, the effects of the present invention appear more remarkably in a case wherein a multicolored plastic article is formed having a large number of closed molding parts.

For example, the typewriter key that is molded using the first stationary molds 21 and 22 illustrated in FIG. 7 and FIG. 8 has a large number of letters, and so has a large number of closed molding parts. However, as illustrated in FIG. 9, given the present invention it is possible to fill the plastic into all of the closed molding parts through merely providing the one flat plate 13 in the movable mold 23 that is used facing the stationary molds 21 and 22. Furthermore, with the stationary mold 21 illustrated in FIG. 7 and the stationary mold 22 illustrated in FIG. 8, it is possible to use the same movable mold 23 regardless of differences in the spelling of the text, and regardless of differences in the positions and numbers of the closed molding parts.

In contrast, in the conventional method, it was necessary to use different movable molds that were

dedicated to the respective stationary molds having a large number of pins 26 at locations corresponding to the respective closed molding parts, with the movable mold 24 illustrated in FIG. 10 for the stationary mold 21 illustrated in FIG. 7 and the movable mold 25 illustrated in FIG. 11 for the stationary mold 22 illustrated in FIG. 8.

(EFFECTS OF THE INVENTION)

Given the method according to the present invention, as explained above, there is the effect of being able to form multicolored articles having a large number of closed molding parts easily because a groove-shaped gap for connecting the plurality of closed molding parts is formed when forming the first molding part. Furthermore, given the mold according to the present invention, it is possible to form plastic conduits to all of the closed molding parts using a single small movable part or a small number of small moveable parts, even in a multicolored article having a large number of closed molding parts, because of the formation, by a single movable small part, of a groove-shaped gap that serves as a plastic conduit to a large number of closed molding parts, thus not only making it possible to manufacture the mold easily, but also having a superior effect of enabling molding using the same movable molds for multicolored articles wherein the locations and numbers of closed molding parts are only slightly different.

4. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 through FIG. 6 illustrate a first example of embodiment, wherein: FIG. 1 and FIG. 2 are cross-sectional drawings of molds; FIG. 3 is a plan view of a movable mold; FIG. 4 is a plan view of a first stationary mold; FIG. 5 is a plan view of a second stationary mold; and FIG. 6 is an oblique view of a first molding portion; where FIG. 7 through FIG. 9 illustrate a second form of embodiment, wherein: FIG. 7 and FIG. 8 are plan views of a first stationary mold; and FIG. 9 is a plan view of a movable mold; where FIG. 10 and FIG. 11 are plan views of conventional movable molds; FIG. 12 is a perspective view of a typewriter key; FIG. 13 is a cross-sectional diagram along the section X-X in FIG. 12; and FIG. 14 is a perspective view of a first molding portion of molded using the conventional method.

- 2, 2': Letter Parts
- 3: First Molding portion
- 4: Second Molding portion
- 5, 5': Closed molding parts
- 8: Movable Mold
- 9: First Stationary Mold
- 10: Second Stationary Mold
- 12: Groove
- 13: Flat Plate (Small Movable Piece)

17: Groove-Shaped Gap

26: Pin

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FIG. 1

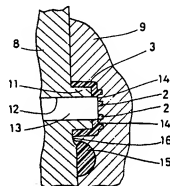


FIG. 2

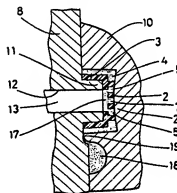


FIG. 3

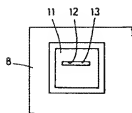


FIG. 4

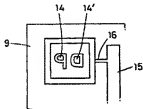


FIG. 5

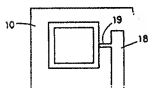


FIG. 7

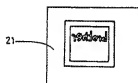


FIG. 8

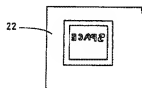


FIG. 9

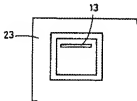


FIG. 6

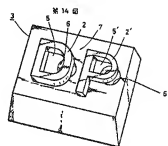
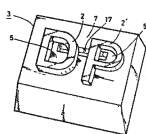


FIG. 10

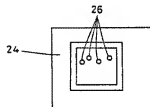


FIG. 11

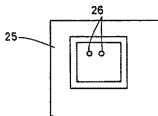


FIG. 12

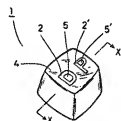


FIG. 13

